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(54) Formation of hermetically-sealed packages

(57) Packages (10) are formed from a continuous strip shaped into a tube around the contents and severed and sealed transversely to form partial end seals (13 and 14). The packages (10) are then reorientated by 90° relative to their direction of travel and at least the partial end seal 13 may be passed along a slot (15) in an evacuated chamber (16) for air extraction. Hermetic seals are formed at both ends of the packages by the use of two band sealers or rotary crimp sealers which can operate for a longer period of time than is possible during transverse severing and sealing in conventional form-fill-seal machines. A heat-fusible sealant is used particularly to fill air channels which occur where the number of layers of packaging strip changes, e.g. in the region of gussets and a longitudinal seal.

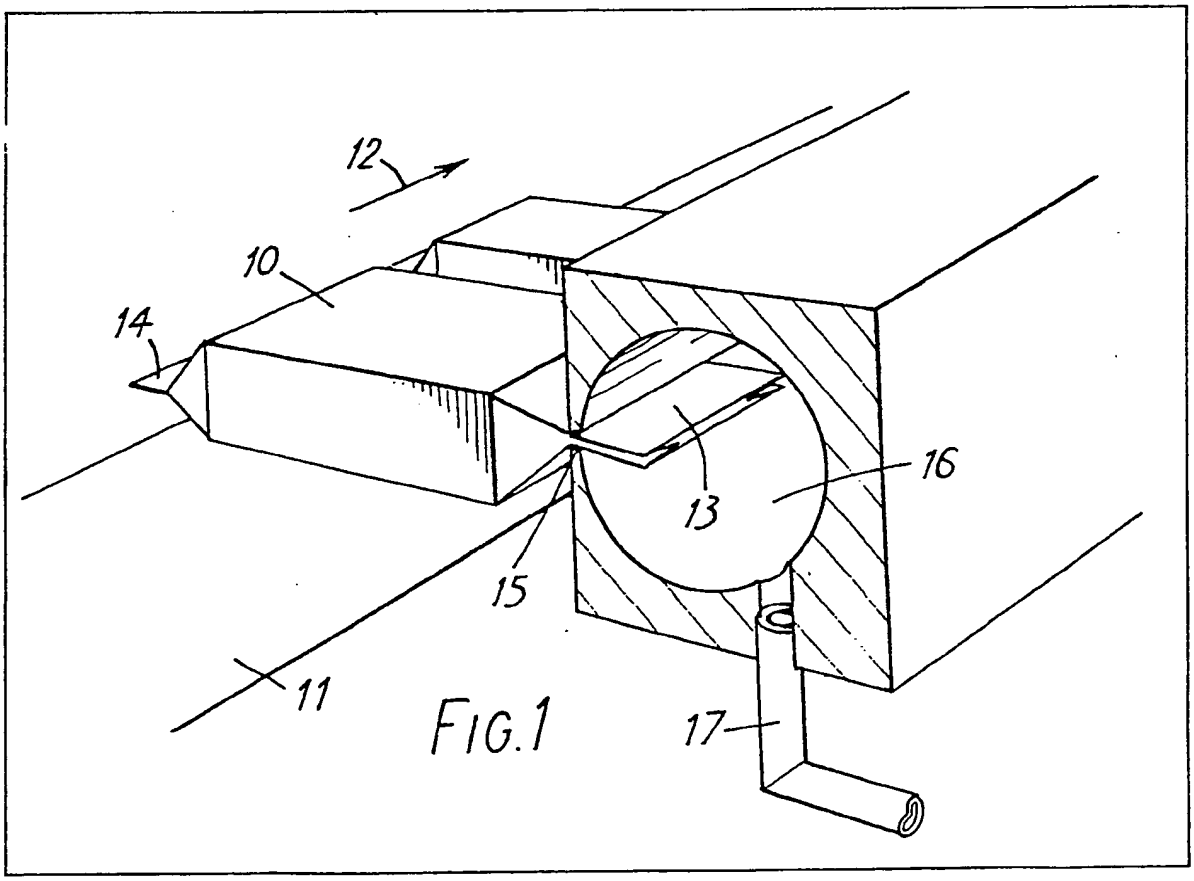

FIG.1

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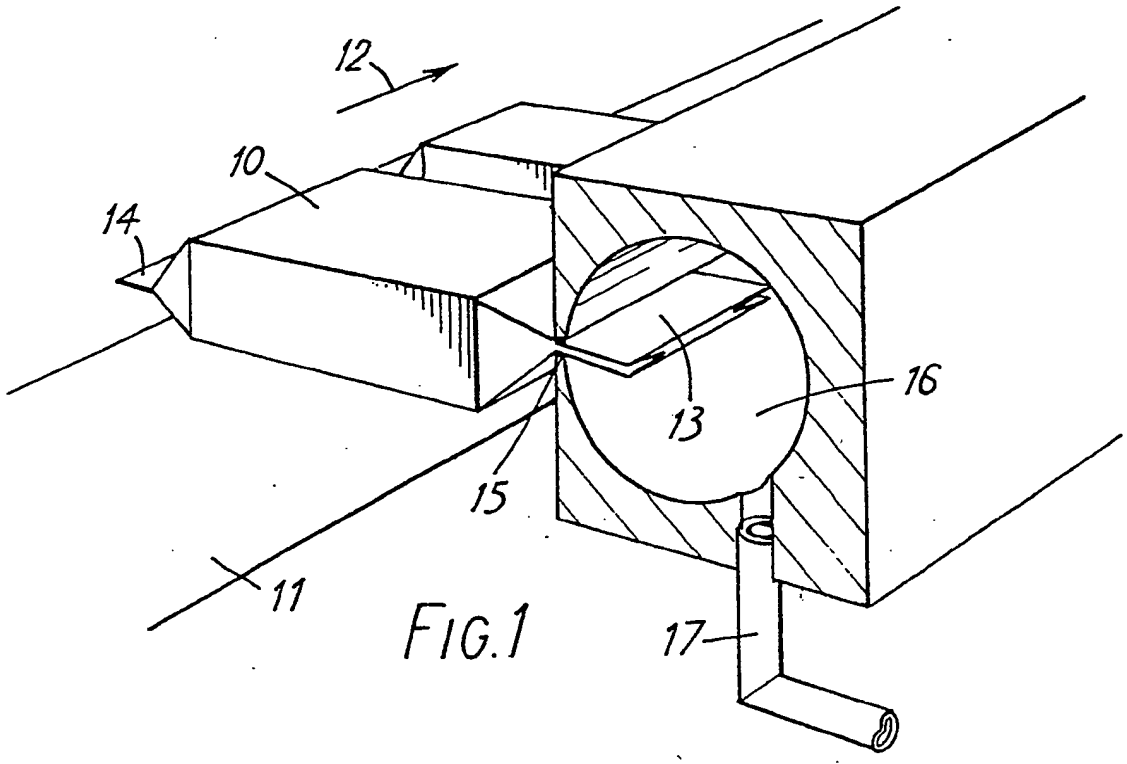

FIG.1

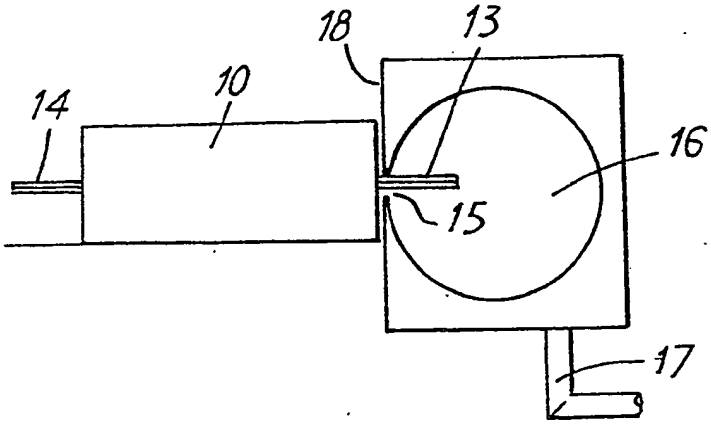

FIG.2

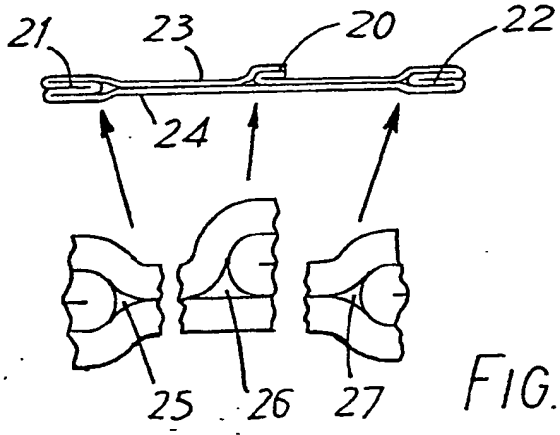

FIG.3

SPECIFICATION

Formation of hermetically-sealed packages

The present invention relates to the formation of hermetically-sealed packages and in particular to packaging machinery and methods which use a strip of flexible packaging material formed into a tube, filled with the product to be packaged, sealed, and then severed to form a series of packages.

Such form-fill-seal machines are widely used. The strip may travel horizontally or vertically. Usually its longitudinal edges are brought together and a continuous seal is made between them so that the strip forms a tube. In a horizontal machine products are inserted in the tube as it is formed and are spaced along the tube so that seals can be made across the tube in the region between the products in order to define individual packages which are subsequently separated by severing across the seal region. There is no difficulty in ensuring a hermetic seal between the longitudinal edges but with the transverse seals it is more difficult. This is partly because a high rate of production of packages is required and the packaging strip therefore travels at high speed, leaving only a short time for the formation of each transverse seal. It is also due to the presence of different numbers of layers of packaging strip at different points across the width of the seal. Where the longitudinal seal has been formed and folded down there will be four layers instead of two. If the tube has been gusseted to form a neater package there will be four thicknesses also at the ends of the transverse seal. Wherever the number of layers changes, and similarly if creases occur in the packaging strip, sealing is likely to be imperfect and leave an air passage extending through the seal.

The presence of such small air channels through the end seals of a package is often of no great importance. Products such as biscuits or chocolate may suffer little deterioration as a result of limited access of air. However in the case of dairy products such as cheese it is desirable so far as possible to remove air from the pack during its formation and to hermetically seal the pack to prevent subsequent entry of air. Equally there may be cases when the presence of air in the pack initially is acceptable but there must be no subsequent entry of contaminated air and therefore a hermetic seal is required.

At present some machines are fitted with air-extracting lances to suck air from the packs as they are sealed but time and space are so limited on high-speed production machines that only a limited degree of success has been achieved.

The present invention seeks to provide both an improved method and machine which enables air to be extracted from the packs before they are sealed and a method of sealing which allows hermetic seals to be achieved more economically. It will be apparent that the air-extraction method requires the subsequent use of a hermetic sealing method, though not necessarily that of the present invention. Conversely the hermetic sealing method of the invention can be used in circumstances where no form of air-extraction is employed.

In accordance with the present invention there is provided a method of forming hermetically sealed packages from a strip of flexible packaging material formed into a tube, filled with the produce to be packed and thereafter severed transversely to form a series of packages wherein after serving of the tube the ends of each package which were adjacent the ends of other packages along the path of travel of the tube are caused to extend from opposite sides of the subsequent path of travel of the packages and are passed through a band sealer or rotary crimp sealer to form a hermetic seal.

Preferably a partial seal is formed during transverse severing of the tube and is completed by the band or rotary crimp sealer. The partial seal is conveniently formed by attaching the surfaces of the strip to each other at one or more positions across the width of the seal zone.

To form the hermetic seal a heat-fusible sealant is preferably provided at least in those regions of the strip which in the formation of the seal lie at a position where the number of layers of the strip changes, this sealant being softened by heat in the band sealer or rotary crimp sealer.

In a preferred embodiment the heat-fusible sealant is applied to the strip as it is unrolled and before formation of the tube, the sealing material being applied in seal zones spaced along the strip which correspond with the position where package end seals are to be formed. The application of the sealing material may be restricted to positions within the seal zones which correspond with changes in the number of layers of the strip present in the seal to be formed so that the heat-fusible material is used solely for filling the air channels which might otherwise occur at these positions. In this case the surface of the strip must be capable of being bonded to itself over the rest of the seal zone. Alternatively the sealing material may be applied across the whole of the seal zone with, if required, additional thickness where air channels might otherwise form.

To enable air to be extracted from the packages before the hermetic seal is formed, at least one end of every package is passed along a slot in the wall of a suction chamber which is arranged directly upstream of the sealer operating on that end of the packages. When air is to be extracted from the package ends it is convenient if the surfaces of the strip are attached to each other at one or more positions across the width of the seal zone during the initial formation and severing of the packages and the seal is then completed after air extraction. This initial attachment is easily achieved in the short time available on the high-speed packaging line. The time for air extraction and final sealing can be longer because although the packs continue to travel at the same speed the length of the suction slot and of the sealing device may be as great as required.

Thus the invention also provides a method of forming packages from a strip of flexible packing material formed into a tube, filled with the product to be packaged, and thereafter severed transversely to form a series of packages wherein after severing the tube the ends of the packages are passed along a

slot in the wall of a suction chamber so that air is extracted from the packages and the package ends are then passed through a band sealer or rotary crimp sealer to form a hermetic seal.

The invention will be described in more detail with the aids of examples illustrated in the accompanying drawings, in which:

Figure 1 is a perspective view, partially in section, of apparatus for carrying out air extraction in accordance with the invention,

Figure 2 is a transverse section of the apparatus of Figure 1, and

Figure 3 is a section of a package end seal with parts shown on an enlarged scale to indicate where leaks are likely to occur.

As seen in Figure 1 packages 10 travel along on a conveyor belt 11 in the direction of the arrow 12. The packages have been formed by folding a continuous strip of packaging film to form a tube, inserting the products to be wrapped, gusseting the tube between the products and severing the gusseted tube transversely while forming a partial seal by attaching the walls of the tube to one another at spaced points by the application of heat and/or pressure. Thus each package 10 has a gusseted partial seal structure 13 extending from one end and a similar seal structure 14 at the other end. The packages 10 in the conveyor 11 have each been turned through 90° relative to their positions when formed by severing the tube. The seal structures 13 are guided into a slot 15 which extends through one wall of a suction chamber 16 which is evacuated by means of a pump attached to the outlet pipe 17. Thus air is extracted from the package by way of the seal structure 13. At the same time the package tends to be drawn against the outer surface 18 of the chamber 16, as shown in Figure 2, which folds the wrapping film closely against the product and leaves less space for air inside the package.

The opposite end seal structures 14 can be passed simultaneously along a second air-extraction slot. Alternatively they may be completely sealed by a band sealer or rotary crimper before the air extraction through the ends 13 commences. It will be appreciated that the slot 15 may be of any desired length to ensure a sufficient duration for the air extraction process. Downstream of the slot 15 the seal structures 13 enter a band sealer or rotary crimper which again can operate one the seal for a sufficiently long time to ensure a hermetic seal.

The problems of forming a hermetic seal are illustrated by Figure 3. Here a strip of film has had its longitudinal edges seamed together at 20 to form a tube. The tube was then flattened and gussets 21 and 22 formed along opposite sides. Over most of the seal zone there are two thicknesses of material 23 and 24 but at the seam 20 and the gussets 21 and 22 this increases to four thicknesses. At these transitions, as shown by the enlarged details, air channels 25, 26 and 27 are formed which are likely to result in leaks through the seal. To ensure sealing of these channels and thus prevent leaks it is proposed to apply a heat-fusible sealant specifically to areas of the packaging film which will define the channels after formation of the package.

The sealant may be applied to the film as it is unrolled from a reel at the beginning of the packaging line and before the edges are brought together to form a tube. The sealant is applied only in seal zones which are spaced along the strip by the length of the packages to be formed. This spacing can be controlled mechanically or by photo-electric cells sensing the ends of the packages further down the packing line. Normal hot-melt adhesive application techniques are used, for example jetting or by printing devices. Polythene is a suitable sealant but other fusible adhesives having enhanced flow properties may be used. The sealant can be applied across the width of the seal with a greater thickness being applied to the regions where air channels are likely to form. Alternatively when the packaging film is capable of being bonded to itself the sealant need only be applied where air channels might otherwise form.

CLAIMS

1. A method of forming hermetically sealed packages from a strip of flexible packaging material formed into a tube, filled with the product to be packed and thereafter severed transversely to form a series of packages wherein after severing of the tube the ends of each package which were adjacent the ends of other packages along the path of travel of the tube are caused to extend from opposite sides of the subsequent path of travel of the packages and are passed through a band sealer or rotary crimp sealer to form a hemetic seal.

2. A method as claimed in claim 1 in which a partial seal is formed during transverse severing of the tube and is completed by the band or rotary crimp sealer.

3. A method as claimed in claim 1 or 2 in which a heat fusible sealant is provided at least in those regions of the strip which in the formation of the seal lie at a position where the number of layers of the strip changes and this sealant is softened by heat in the band sealer or rotary crimp sealer to form the hermetic seal.

4. A method as claimed in claim 3 in which the heat fusible sealant is applied to the strip before it is formed into a tube.

5. A method as claimed in any of the preceding claims in which before passing through the sealer at least one end of every package is passed along a slot in the wall of a suction chamber so that air is extracted from the package.

6. A method of forming packages from a strip of flexible packing material formed into a tube, filled with the product to be packaged, and thereafter severed transversely to form a series of packages wherein after severing of the tube the ends of the packages are passed along a slot in the wall of a suction chamber so that air is extracted from the packages and the package ends are then passed through a band sealer or rotary crimp sealer to form a hermetic seal.

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